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Attorney Docket No. TOMK0002  
Client Matter No. 20617.0002

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	10/692,998	Confirmation No.	9351
Applicant:	Graham DAVIS	Title:	AMPHIBIOUS VEHICLE
Filed:	October 24, 2003		
TC/A.U.	3617		
Examiner:	Andrew D. WRIGHT		
Docket No.	TOMK0002		
Customer No.	25235		

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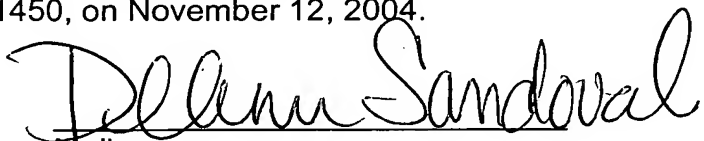
Sir:

The undersigned hereby certifies that the enclosed


1. Transmittal of Certified Copy of Priority Application and copy of Priority PCT Application;
2. Certified Copy of GB 0110347.2;
3. Copy of PCT/GB02/01908 as Published;
4. Return Card, and

this Certificate of Mailing by Express Mail relating to the above application, were deposited as "Express Mail," Mailing Label No. EL533456281US with the U.S. Postal Service, addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on November 12, 2004.

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TRANSMITTAL OF CERTIFIED COPY OF PRIORITY APPLICATION AND  
COPY OF PRIORITY PCT APPLICATION

Commissioner for Patents  
P.O. Box 1450  
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Sir:

Enclosed herewith is a certified copy of GB 0110347.2 from which priority in the present case is claimed. Also enclosed is a copy of the priority PCT/GB02/01908 specification and drawings as filed, in the form of WIPO Publication No. WO 02/087907, from which priority is also claimed.

Please contact the undersigned by telephone with any questions regarding the enclosed.

Respectfully submitted,

November 12, 2004

  
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the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 2006 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name by which it is so re-registered.

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127 APR 2001

The Patent Office

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Newport  
Gwent NP9 1RH

1.	Your reference	P2439-GB		
2.	Patent application number (The Patent Office will fill in this part)	0110347.2		
3.	Full name, address and postcode of the or of each applicant (underline all surnames)	SEALANDER MARINE INTERNATIONAL LTD 3 The Crescent Plymouth Devon PL1 3AB		
	Patents ADP number (if you know it)	8136731001		
	If the applicant is a corporate body, give the country/state of its incorporation			
4.	Title of the invention	AN AMPHIBIOUS VEHICLE		
5.	Name of your agent (if you have one)	K R Bryer & Co		
	"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)	7 Gay Street Bath BA1 2PH		
	Patents ADP number (if you know it)	10777002		
6.	If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number	Country	Priority application number (if you know it)	Date of filing (day / month / year)
7.	If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application	Date of filing (day / month / year)	
8.	Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if: a) any applicant named in part 3 is not an inventor, or b) there is an inventor who is not named as an applicant, or c) any named applicant is a corporate body. See note (d))	YES		

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Description	7	✓
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Priority documents

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Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)

Request for preliminary examination and search (*Patents Form 9/77*)

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Any other documents  
(please specify)

11. I/We request the grant of a patent on the basis of this application.



Signature

Date  
26/04/01

12. Name and daytime telephone number of person to contact in the United Kingdom  
Mark Shelley  
(01225) 428877

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## AMPHIBIOUS VEHICLE

This invention relates to amphibious vehicles and in particular concerns  
5 improvements relating to the stability of amphibious road vehicles on water.

The design of amphibious vehicles is often a compromise between the conflicting  
design requirements of road and water vehicles. For instance, amphibious road  
vehicles must satisfy certain design criteria for road use which conflict with water  
10 borne stability criteria. Water borne stability can be less than optimum when vehicle  
dimensions, in particular width, are determined for road use since narrow body  
amphibious vehicles optimised for manoeuvrability on roads generally have unstable  
narrow hulls.

15 There is a requirement for an amphibious road vehicle which is suitable for road and  
water use and which is both stable on water and manoeuvrable on land particularly  
on roads.

According to an aspect of the invention there is provided an amphibious vehicle  
20 having at least one sponson. In the context of the present invention the term sponson  
includes any flotation device positioned laterally on the hull of an amphibious vehicle.

The additional buoyancy provided by the sponson improves the stability of the  
amphibious vehicle on water and allows narrow hull designs to be used for  
amphibious vehicles. A narrow hull can reduce hydrodynamic drag and hence fuel  
25 consumption as well as allowing higher vehicle speeds on water. Narrow hulls are

also preferable for narrow body amphibious road vehicles.

Preferably, the sponson is movable between a stowed position and a deployed position. In this way the sponson may be moved to a deployed position for use of the vehicle on water and stowed when the vehicle is operating on land.

In preferred embodiments, the sponson is movable with respect to a main hull of the said vehicle.

The sponson may be spaced at least one hull width away from the said hull when in the said deployed position. This improves stability since the buoyancy forces acting on the sponson can provide a significant turning moment on the vehicle to stabilise the vehicle by reducing the vehicle's tendency to roll in both calm and rough water conditions.

15

The sponson may also be substantially flush with the said hull when in said stowed position. This allows the frontal cross-section area of the vehicle to be reduced when the sponson is not required, that is when the vehicle is to be driven on the road. Not only does this provide for vehicle manoeuvrability on the road but it also reduces aerodynamic drag on the vehicle when moving on the road.

20

Preferably, the sponson is positioned substantially parallel with the main hull when in the said stowed and deployed positions. This reduces hydrodynamic drag when in the deployed position and allows the sponson to be readily stowed next to the hull

when not in use.

Preferably, the sponson is pivotally mounted with respect the said main hull. This readily permits the sponson to be deployed for use.

5

In preferred embodiments, the sponson comprises part of a respective parallelogram type four-bar linkage pivotally mounting the sponson with respect to the said main hull. The four bar linkage geometry provides for easy and accurate deployment of the sponson to its deployed position and further provides a mechanically stiff and robust structure which can readily transmit buoyancy turning moments generated by the sponson to the hull of the vehicle.

The sponson may be pivotally mounted with respect to the main hull about pivot axes inclined with respect to the plane of the keel of the said hull such that the sponson is raised with respect to the keel when moved from its stowed to deployed position. The sponson can be moved to a preferred operational position above the keel line of the main hull when deployed and stowed in a lower non-obstructive position when not in use.

20 In preferred embodiments, the sponson moves in an aft direction with respect to the vehicle when moved from its stowed to deployed position. This provides for a more compact design.

The amphibious vehicle preferably comprises a sponson on each side of the vehicle.

In this way buoyancy turning moments can be applied to the vehicle in both directions. This improves the above mentioned advantages since vehicle stability is significantly improved.

- 5 In preferred embodiments, the vehicle comprises fore and aft road wheels and the sponson is stowed in the region between the said fore and aft wheels. This provides a compact design and readily allows the sponson to be deployed without interfering with the road wheels.
- 10 In preferred embodiments, the amphibious vehicle comprises road wheels which are movable between a fully deployed position for road use and a stowed position for water borne operation, whereby the ride height of the vehicle on land can be adjusted by positioning the said wheels intermediate the said fully deployed and stowed positions. By retracting the road wheels to their stowed position hydrodynamic drag
- 15 forces can be reduced.

The road wheels may be pivotally mounted with respect to the main hull of the vehicle for movement between their said respective stowed and deployed positions. This readily allows the road wheels to be moved between their respective stowed and

20 deployed positions.

Preferably, the amphibious vehicle is a passenger vehicle.

Various embodiments which more particularly describe the invention will now be

described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is an exploded view of the main components of an amphibious road vehicle;

5        Figure 2 is a side elevation of an amphibious vehicle comprising the components shown in Figure 1;

Figure 3 is a cross-sectional view along line I-I of Figure 2; and

Figure 4 is a plan view in the direction of arrow A in Figure 2.

10       Referring to Figure 1 the main structural components of an amphibious road vehicle 10 are shown in exploded view. The main structural components include a mono-hull 12, a passenger deck 14 and a passenger cabin 16. The vehicle 10 also comprises a pair of sponsons 18, only the starboard sponson being shown in Figure 1. The mono-hull, deck, passenger cabin and sponsons are constructed using an epoxy glass  
15       reinforced material and high density foam in a sandwich laminate construction. The sponsons 18 are additionally filled with a solid buoyancy material.

The main structural components are assembled to form an amphibious road vehicle of the type indicated at 20 in Figure 2. The amphibious vehicle of Figure 2 has a  
20       length of approximately 12 metres a beam or width for approximately 2.5 metres, a high of approximately 4 metres and is adapted to carry 40 passengers and 2 crew members. The vehicle 20 has fore and aft road wheels 22 and 24 positioned towards the vehicle's bow 26 and stern 28 respectively. The wheels 22 and 24 are rotatably mounted on respective pivot supports 30 which are pivotally mounted about

respective pivot axis 32 for movement of the wheels between the deployed position shown in Figure 2 and a stowed position (not shown) above the nominal water line indicated by the chain dot line 34. The fore and aft pivots 30 are movable about their respective pivot axes 32 in the direction indicated by the respective directional arrows

5 36. A sponson 18 is mounted on each side of the vehicle 20 between the fore and aft wheels 22 and 24 below the deck 14 (towards the bottom of the drawing in Figure 2).

Referring to Figure 3, the port and starboard sponsons are each pivotally connected to a respective side of the hull 12 by means of arms 38. The arms 38 are generally X-

10 shaped having two pivotal connection points 40 at one end connecting the arm to the sponson and two further pivotal connection points 42 at the other end connecting the arm to the hull about an axis 44 inclined with respect to the plane of the hull indicated by the chain dot line 46. The sponsons 18 are each movable between their respective stowed positions, as indicated by the dashed sponson outlines 48 where they lie

15 parallel with and adjacent to the hull 12, and their respective deployed positions as shown by the solid lines in the drawing. When deployed to the position shown in Figure 3 the sponsons are spaced at least one hull width away from the sides of the hull so that the overall width or beam of the vehicle is extended to approximately 6 metres from starboard to port sponson.

20

As shown in Figure 3 the inclined nature of the pivot axes 44 causes the sponsons 18 to move in a direction away from the keel 50 of the hull when deployed so that the sponsons contribute little to the buoyancy of the vehicle other than to stabilise the vehicle on the water. The primary buoyancy of the vehicle is provided by the mono-

hull 12. This reduces the loads supported by the arms 38 during normal operation.

The action of raising the sponsons to the deployed position shown above the keel line has the desired effect that the sponsons act mainly as stabilisers and not secondary hulls.

5

Referring now to Figure 4, the sponsons 18 are each pivotally connected to a respective side of the hull 12 by two arms 38 spaced along the length of the hull. On each side of the vehicle the sponson 18 forms part of a parallelogram type four bar linkage with the arms 38 and the hull 12 so that the sponson can be readily moved  
10 between the deployed position, shown where it lies parallel with and spaced apart from the hull 12, and the stowed position indicated by the respective dashed outlines 51 by movement of the arms 38 about their respective pivot axes 44 through an arc of approximately 90° as indicated by respective chain lines 52. The four bar linkage arrangement causes the sponsons 18 to move aft when they are moved from their  
15 stowed position to their deployed position. Throughout the movement sequence the sponsons remain parallel with the hull 12 until they are locked in the deployed position by locking means (not shown).

The drawing of Figure 4 also shows the position of the for and aft road wheels when  
20 moved to their raised position above the water line 34. The raised or stowed position of the four road wheels 22 is indicated by the chain dot lines 22' and the stowed or raised position of the aft road wheels 24 is indicated by the chain dot lines 24'.

## CLAIMS

1. An amphibious vehicle having at least one sponson.  
5
2. An amphibious vehicle as claimed in Claim 1 wherein the said at least one sponson is movable between a stowed position and a deployed position.
3. An amphibious vehicle as claimed in Claim 2 wherein said at least one  
10 sponson is movable with respect to a main hull of the said vehicle.
4. An amphibious vehicle as claimed in Claim 3 wherein the said at least sponson is spaced at least one hull width away from the said hull when in said deployed position.  
15
5. An amphibious vehicle as claimed in Claim 3 or Claim 4 wherein the said at least one sponson is substantially flush with the said hull when in said stowed position.
- 20 6. An amphibious vehicle as claimed in any one of Claim 3 to 5 wherein the said at least one sponson is positioned substantially parallel with the said main hull when in the said stowed and deployed positions.
7. An amphibious vehicle as claimed in any one of Claims 3 to 6 wherein the  
25 said at least one sponson is mounted with respect the said main hull by a linkage of



pivoted arms.

8. An amphibious vehicle as claimed in Claim 7 wherein the said at least one sponson comprises part of a parallelogram linkage pivotally mounting the sponson with respect to the said main hull.

5

9. An amphibious vehicle as claimed in Claim 7 or Claim 8 wherein the said at least one sponson is pivotally mounted with respect to the main hull about pivot axes inclined with respect to the plane of the keel of the said hull such that the sponson is raised with respect to the keel when moved from its stowed to deployed position.

10

10. An amphibious vehicle as claimed in any one of Claims 7 to 9 wherein the said at least one sponson moves in an aft direction with respect to the vehicle when moved from its stowed to deployed position.

15 11. An amphibious vehicle as claimed in any preceding claim comprising a sponson on each side of the vehicle.

12. An amphibious vehicle as claimed in any preceding claim wherein said vehicle comprises fore and aft road wheels and said at least one sponson is stowed in the  
20 region between the said fore and aft wheels.

13. An amphibious vehicle as claimed in any preceding claim wherein the vehicle comprises road wheels which are movable between a fully deployed position for road use and a stowed position for water borne operation, whereby the ride height of the

vehicle on land can be adjusted by positioning the said wheels intermediate the said fully deployed and stowed positions.

14. An amphibious vehicle according to Claim 13 wherein the said road wheels  
5 are pivotally mounted with respect to the main hull of the vehicle for movement between their said respective stowed and deployed positions.

15. An amphibious vehicle as claimed in any preceding claim wherein said vehicle is a passenger vehicle.

10

16. An amphibious vehicle substantially as hereinbefore described with reference to the accompanying drawings.

15

**ABSTRACT****AMPHIBIOUS VEHICLE**

An amphibious vehicle 20 for land and water use comprises a main mono hall section  
5 12 and a pair of port and starboard sponsons 18 which are movable from the stowed  
position under a main vehicle deck adjacent to the mono hall 12 and a fully deployed  
position in which the sponsons are spaced apart from the mono hall by at least one  
hall width. The sponsons are each pivotally connected to the main hall by means of  
a pair of respective arms 38 which together with the sponson and the hall define a  
10 parallel type four bar linkage. The sponsons stabilise the vehicle on water and are  
readily stowed to allow vehicle mobility on land.

15

(Figure 3)

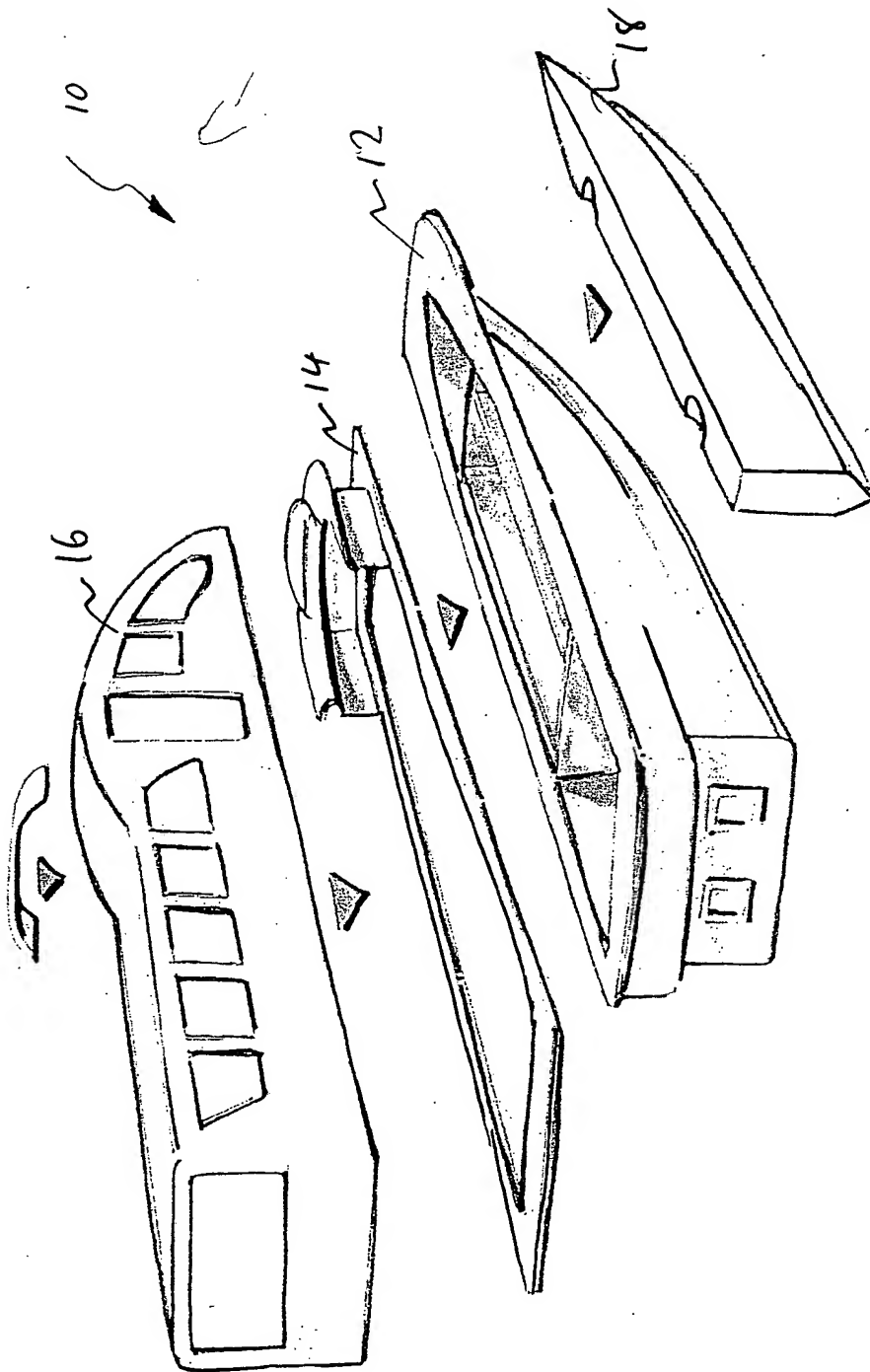
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FIG 1

[F] ASSEMBLY

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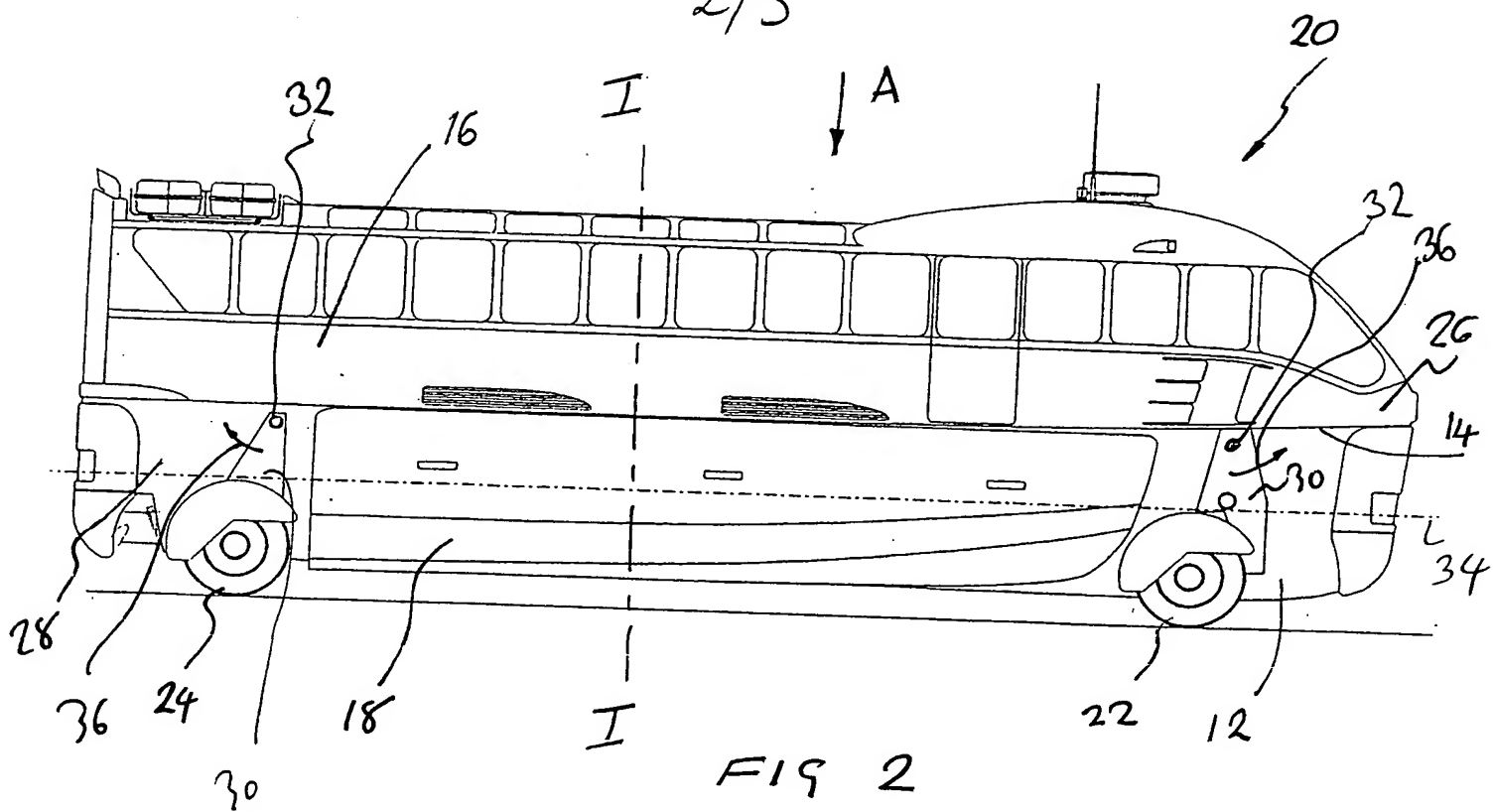


FIG 2

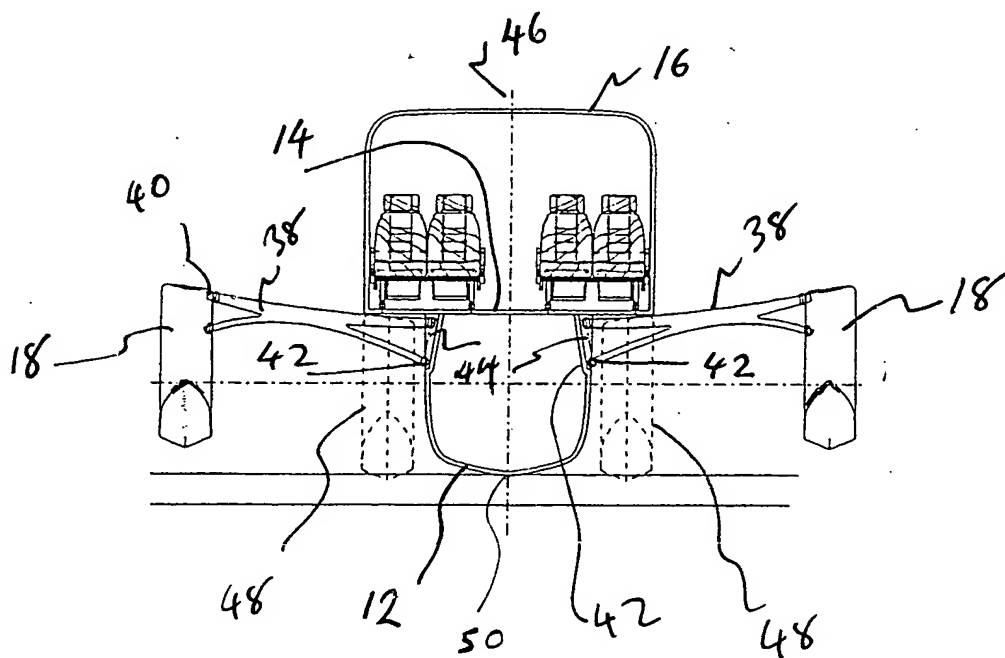


FIG 3

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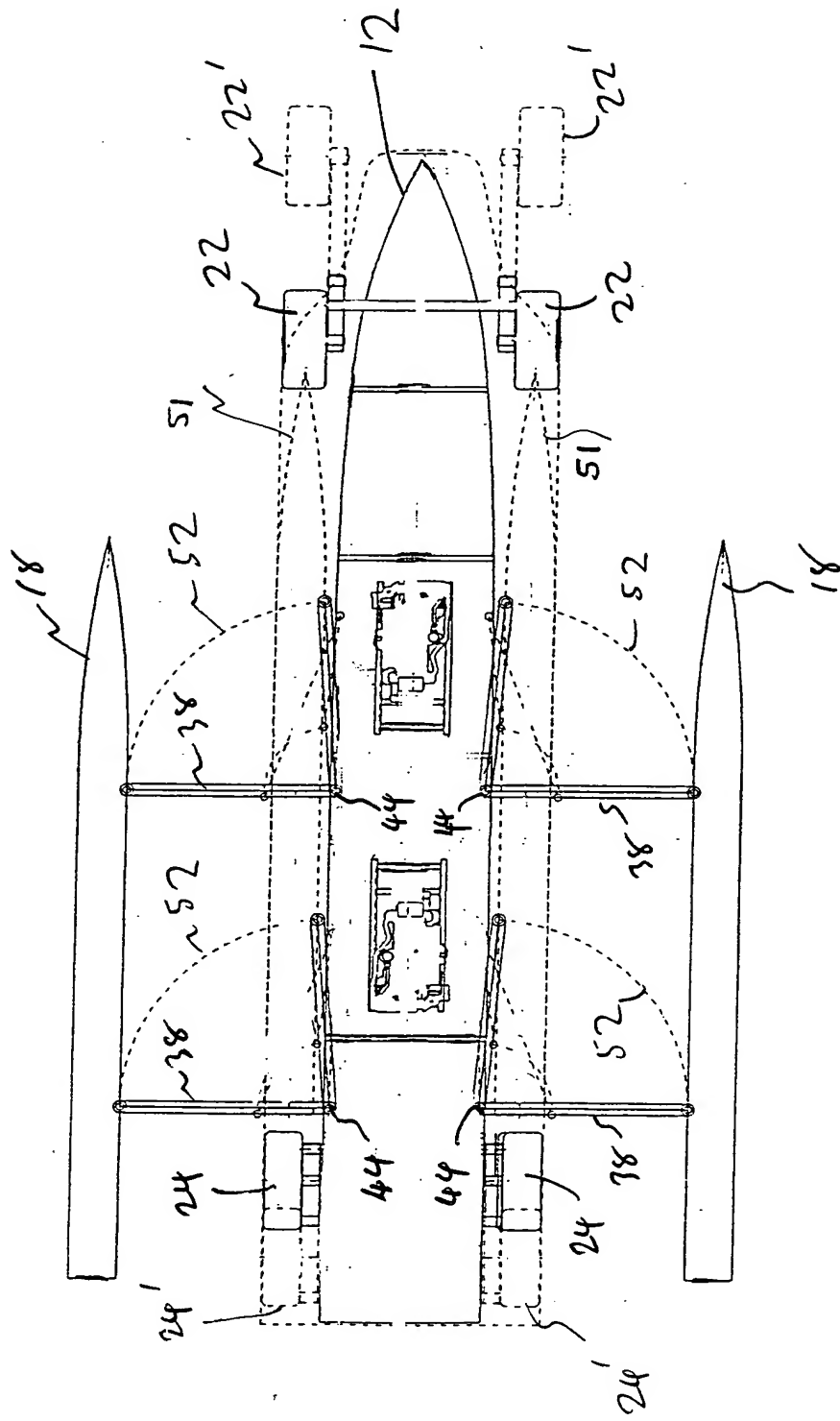


FIG 4

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